

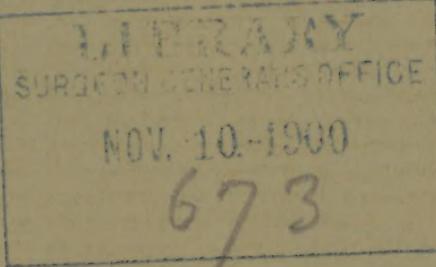
JONES (W. S.)  
and KEEN (W. W.)

TWO UNUSUAL CASES  
OF SURGERY OF THE TRACHEA.

*presented*

BY

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## TWO UNUSUAL CASES OF SURGERY OF THE TRACHEA.<sup>1</sup>

I.—Attempted Suicide by Cut-Throat followed by Complete Closure of the Trachea by a Diaphragm above the Cannula and Persisting for 13 Months; Breathing Through the Larynx and Speech entirely Impossible. Operation: Dissection of the Diaphragm; Suture of the Trachea; Restoration of Normal Breathing and Voice.

II.—Stricture of the Trachea; Successful Operation by Dividing the Trachea Longitudinally, Reflecting the Mucous Membrane, Excision of the Stricture, and Immediate Suture of the Entire Wound; Union by First Intention.

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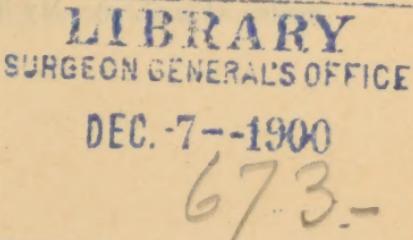
### CASE I.—DIAPHRAGM IN THE TRACHEA AFTER CUT-THROAT.

#### HISTORY BY DR. JONES.<sup>2</sup>

J. W. C., 30 years old, a laborer, on November 12, 1896, in a fit of despondency, attempted suicide by making a large cut in his throat with a penknife. He penetrated the trachea about the second or third ring, twisted the blade about and cut up and down for an inch or more. He was taken to a hospital, where the wound was dressed, but not closed, nor

<sup>1</sup> Read before the Surgical Section of the American Medical Association, June 7, 1899, at Columbus, Ohio.

<sup>2</sup> From a former report in the *Journal of the American Medical Association*, March 12, 1898, p. 607.



was a tube inserted. One week later it was noticed that he could not breathe through the mouth when the wound was closed by pressure. It was deemed necessary to introduce a tracheotomy-tube; an anesthetic was given him, the tube inserted, and the wound stitched around it. Two weeks later, the surgeon attempted to pass a tube through the trachea and larynx from the tracheal wound, but did not succeed, the part being shut off. He was then sent home to allow the wound to heal before further operative interference was instituted. Nothing further, however, was done, and he was sent to me. The condition of the larynx was as follows: The right side was drawn slightly downward, the right vocal band was in the median line and immovable, being fixed by scar-tissue beneath it; the left side was normal in situation, the chord was freely movable and could be brought to the middle line perfectly. The entire left side was free for  $\frac{3}{4}$  in. below the vocal band, while the right side had a band of cicatricial tissue just below the chord, which extended downward for  $\frac{3}{4}$  in. and then spread out to the other side, completely occluding the trachea. The surface of the membrane was smooth and the lowest point was near the center. From below, the trachea was entirely closed above the tube, and the cicatrix was about  $\frac{1}{2}$  in. in thickness.

#### OPERATION BY DR. KEEN.

When I first saw the man I was able easily to verify the facts observed by Dr. Jones. The patient had never breathed through his larynx nor had he spoken a word since the accident. He was still wearing a tracheotomy-tube. On removing this tube, one could look into the trachea very readily and see that the diaphragm observed by the laryngoscope below the glottis was not a horizontal one, but curved (Fig. 1), precisely fitting the curve of the tracheotomy tube. In breathing, all the air passed through the tube. Naturally Dr. Jones and I first discussed the question whether this membrane could be punctured by an instrument passed through the glottis. If so, the opening could then be dilated and after the caliber of the trachea was restored, the tracheotomy opening could be closed. After considering this method of operation, we decided that it would be working too much in the dark and in too narrow a space, and that it would be better to attack the diaphragm from in front. The result proved that this was a wise precaution.

The operation was performed on December 15, 1897. I made an incision in the middle line from the tracheotomy opening up to the cricoid cartilage. This incision was very cautiously carried downward in the middle line of the obliquely curved diaphragm, and a little above the middle of the incision in the diaphragm a small opening was quickly made. (Fig. 1, a). My impression was that this opening

would lead me into the trachea above the diaphragm. Just at that moment, however, he vomited, and through the opening there escaped frothy mucus tinged with bile. This showed me, of course, that instead of opening through the diaphragm into the upper air-passage my opening communicated with the esophagus. It was clear to me, therefore, that the esophagus, by contraction of the adhesions, had been drawn forward, and that my incision was at *a* in Fig. 2. It was important, therefore, to close this very small opening at once. I dis-

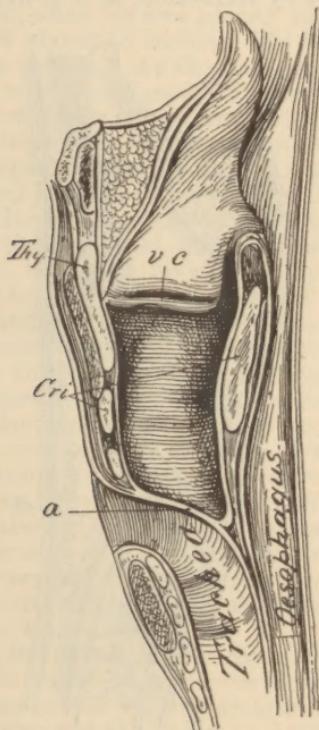


FIG. 1.—The apparent relation of the diaphragm. (*Thy.*) Thyroid cartilage; (*Cri.*) cricoid; (*v.c.*) vocal chords; (*a*) the site at which I supposed an incision would open into the larynx and enable me to dissect away the diaphragm.

sected back the mucous membrane from its borders and then closed it under the mucous membrane, as if it had been an opening in the intestine, with two series of Lembert sutures and then sutured the mucous membrane over them. I next made another small opening about 7 or 8 mm. above it, anterior to the opening which I had just made into the esophagus (Fig. 2, *b*), and found to my satisfaction that I had opened into the upper air-passage. A pair of curved hemostatic forceps passed into the mouth readily protruded through the

opening in the diaphragm. I now dissected out the diaphragm completely. As soon as this was done the anterior wall of the esophagus, which had been drawn forward by the contraction, fell backward into its normal position and left in front of it a trachea completely divided into an upper and a lower portion. (Fig. 3) The two ends of the trachea were now sutured together by four sutures upon each side and two posteriorly. I found that the lower trachea was easily approximated to the upper, having fallen downward partly by its weight and partly by retraction, as if it were a spiral spring.

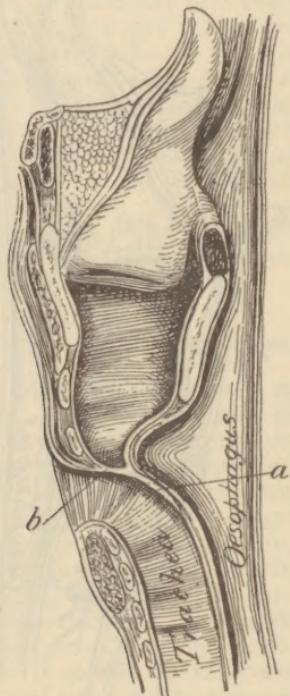


FIG. 2.—Showing the actual relations of the diaphragm and the forward displacement of the anterior wall of the esophagus. (a) The opening first made by error into the esophagus and at once closed; (b) the second opening entering the larynx, from which I dissected away the diaphragm.

The small anterior opening left was closed by three sutures. All the sutures were of silk. The sutures uniting the two ends of the trachea were passed completely through the thickness of the trachea, except posteriorly, where I was careful not to penetrate the esophagus. As I was fearful that there might be swelling, which would interfere with respiration and destroy the good results thus far obtained, or that some unforeseen complication might arise in so unusual a case, I con-

tinued my incision in the trachea below the site of the old tracheotomy opening, and inserted the tube into the trachea 3 cm. lower down. This made sure of easy breathing while the cicatrization of the recent tracheal wound above it was going on. If, then, the upper part of the operation-wound healed, the simple removal of the tracheotomy tube at a suitable time would be followed by complete spontaneous closure of the opening.

The entire operation was done with the patient in the Trendelenburg posture to prevent aspiration of wound fluids into the lungs, and, after he was placed in bed, the foot of the bed was raised about 18 inches. He lay without a pillow for the same reason. At the end of three days this inclined posture was abandoned. The nose and also the throat were sprayed every two hours with a boric-acid solution, as they and the tracheotomy opening had been for two days before the operation. For three days he was fed entirely by the rectum in order to prevent motion of the larynx in deglutition. His temperature only once exceeded 100°. After three days there was so little soreness that not only was his bed made level, but he was fed by the mouth, and on the fourth day he was allowed to be out of bed. On the sixth day I removed the tracheotomy tube and found that he could both breathe freely and speak audibly. I did not, therefore, replace the tube. The only dressing applied to the wound was gauze moistened with a bichlorid solution 1-2000, sterile gauze being packed gently around the tracheotomy-tube and covering the opening of the tube. After the sixth day a simple dry-gauze dressing with an apron of gauze hanging down over the second tracheotomy opening (from which the tube had been removed already), so as to protect it from dust, was used. The operation wound healed by first intention throughout. The tracheotomy wound, as soon as the tube was removed, gradually contracted and was entirely closed at the end of six weeks.

The sutures in the wound never gave him the slightest trouble. Only one of them was ever observed by the laryngoscope. His voice was slightly hoarse, but not to such a degree but that one would think it was his normal speech.

The present case, so far as we have been able to learn, is almost if not quite unique. We have seen a number of cut-throats, but in those that recovered we have never seen any such membrane form. It must have been a result of the contraction following the extensive laceration, which drew the anterior wall of the esophagus over the curved upper surface of the tracheotomy tube, for it exactly fitted its contour. Had an

attempt been made to open it from above by any sharp cutting instrument, there would have been great danger of entering the esophagus, and one would not have had the facility, or even the opportunity, of closing it with ease. It has occurred to us that possibly if a blunt instrument like a uterine sound had been passed by the mouth between the vocal bands and made to bulge the

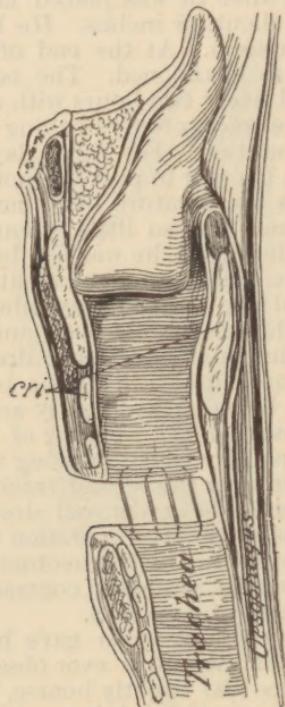


FIG. 3.—Showing the anterior wall of the esophagus, fallen back into its normal position and the complete severance of the trachea when the diaphragm had been dissected away. The lateral sutures uniting the trachea are indicated.

membrane from above, one might have cut with a little more security and certainty through the diaphragm. On the whole, we are inclined to think that the mode of operation, by attacking it from the outside rather than by an intra-laryngeal operation, was a fortunate one.

In the suicidal attempt the right recurrent laryngeal nerve was probably divided or at least wounded. This accounts for the paralysis of the right vocal chord, which persists and has resulted in a moderate hoarseness. At the present time, 17 months after operation, his voice is almost normal and almost free from hoarseness. The right chord is still paralyzed, the left freely movable; a slight narrowing of the lumen of the trachea at the site of operation is observed, but not sufficient appreciably to obstruct the breathing.

Föderl (*Wien. klin. Woch.*, 1896, p. 1258) has a very excellent paper on resection and suture of the trachea in which a number of cases are reported, but none of them at all resemble this. The bayonet-resection of Colley (*Deut. Zeitschr. f. Chir.*, 18—, Bd. 40, p. 150) was not adopted, since it was found that the parts could be so readily approximated and the adjustment seemed to be perfect. Silk sutures were used, and yet reluctantly. But we thought that in order to get the narrow edges of the upper and the lower portions of the trachea to unite satisfactorily they must be held in place for a considerable time, which catgut would not do. Probably silk would not only hold them in position for a sufficient length of time to secure firm union, but if any of the sutures cut or ulcerated their way through into the trachea they would be readily expectorated. The result more than justified our hopes, for the silk was scarcely any source of irritation.<sup>3</sup>

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<sup>3</sup> The following papers are of interest in connection with this case:

Föderl: *Wien. klin. Woch.*, 1896, p. 1258.

Fischer: *Deutsche Chir.*, Bd. xxxiv.

Noll: *Deutsche Zeitschr. f. Chir.*, Bd. xxvii.

Schüller: *Ibid.*, Bd. xli.

Colley: *Ibid.*, Bd. xl, 150.

Gussenbauer: *Sitz. k. k. Gesellschaft der Aerzte in Wien*, Januar 22, 1875.

v. Eiselsberg: *Deutsche med. Woch.*, 1896, No. 22.

## II.—STRICTURE OF THE TRACHEA.

## HISTORY BY DR. JONES.

Miss E. K., aged 21, of Smithville, N. J. Her parents, one brother and one sister are living and in good health. At the age of 7 she had measles and chickenpox, malaria at 8 and whooping-cough at 9. Since having the latter she has had more or less catarrhal inflammation of the nose and throat. Her menstruation began when she was 14 years and is regular. In July, 1895, she sung during the evening in the open air. The following morning there was a little soreness on both sides of the throat, at the base of the tongue. In the course of a few days the pain centered at a point immediately above the sternum. There was a tickling sensation which caused paroxysms of coughing. Her condition remained about the same for a month, when, after a visit of two weeks to the seashore she returned feeling perfectly well. In the autumn of 1896, she noticed a whistling sound in the throat after slight exercise. From November, 1896, to January, 1897, she was kept on a strict milk diet to remedy an indigestion from which she suffered, her general health being, meantime, rather poor. In the spring of 1897, while attending a ball, she experienced great difficulty in breathing, after dancing. Ever since that time, slight exercise has caused considerable dyspnea. In December, 1897, she had an attack resembling spasmodic croup. After this the pain in her throat became more severe, and she had considerable expectoration, the sputa being white and frothy, but containing dark specks. In February, 1899, during the blizzard, she again had an attack of what was supposed to be spasmodic croup. From that time till now she has been suffering constantly from more or less dyspnea, especially marked on exercising. Even quiet respiration produces a slight sound, but after exercising her breathing is distinctly audible and suggests a stenosis of the air-passages at some point.

At his time, she consulted Dr. Jones, who immediately discovered the cause of her trouble. The laryngoscopic examination showed at a short distance below the vocal bands a small, nearly round opening (Fig. 4), the diameter of which was about half the distance of the vocal bands from each other. Dr. Jones made several attempts at dilatation, but found that the throat was so irritable that the patient could not endure the procedure. In view of this and the very long treatment which it would require, which was very inconvenient for her, as she did not live in the city, he asked Dr. Keen to see her in consultation with a view to operation. After a careful examination, we reached the conclusion that the stenosis was but a little distance below the cricoid and extended over somewhat more than one ring.

## OPERATION BY DR. KEEN.

On March 31, 1899, I made a vertical incision from the middle of the thyroid nearly to the sternum, and was extremely careful to see that every bleeding vessel was tied before opening the trachea. The patient first took chloroform in the horizontal position. As soon as I was ready to open the trachea, I placed her in the Trendelenburg position and then split the trachea longitudinally for about 6 or 7 rings, but found that to get free access to the stricture, it was necessary to split the cricoid. I then placed in the lower part of the incision in the trachea a tracheotomy tube and connected it with the chloroform inhaler by means of the inner tube of a Hahn tampon-cannula 12 mm. in diameter, fastening the

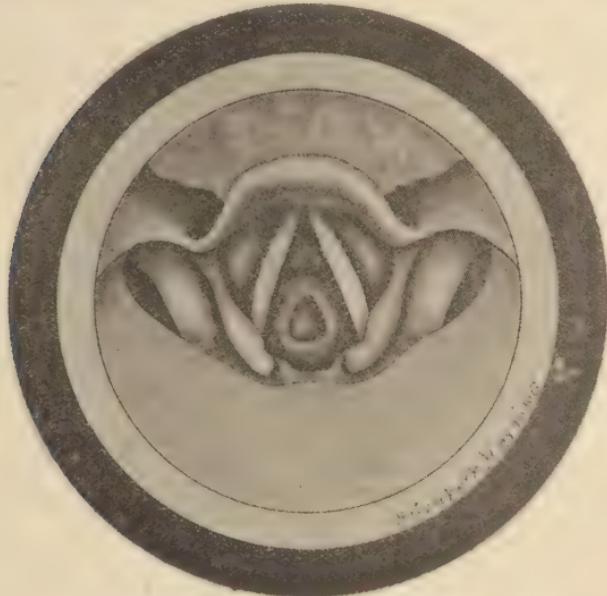


FIG. 4.—Appearance of the stricture in the laryngeal mirror.

tube in place by disinfected tapes. The outer sponge-covered portion of the Hahn cannula was not used. I then found that the upper border of the stricture was at the third tracheal cartilage and extended over the third and fourth and to the upper border of the fifth. The somewhat puckered appearance of the mucous membrane suggested that it might be the result of a local ulcer, though her history scarcely furnished a sufficient basis for such a belief.

I at first thought that I might do a Heineke-Mikulicz operation, but on making the incision and endeavoring to draw the sides apart, I found that the resistance of the sub-

mucous tissue was too great. Accordingly I dissected back the mucous membrane as two flaps upward and downward over all the area covered by the stricture. I next dissected out the fibrous tissue. By an unfortunate accident this was lost and so no microscopic examination could be made. During this procedure the sides of the trachea were held apart partly by narrow retractors and partly by two silk sutures, which were held by assistants. These silk retractors served especially well. The hemorrhage was not severe, but was troublesome by obscuring the field of operation. It was sponged away with small pads of gauze. One vessel on the wall between the trachea and the esophagus spurted to such an extent that I tied it with a catgut. This I afterwards removed and twisted the vessel so as not to have the projection of the knot, which by bulging forward the mucous membrane might interfere with respiration. The wall of the esophagus was exposed at one point. I next sutured the mucous membrane with silk, but in the middle line I could not bring it quite together. A little gap was left there to granulate. The chloroform tube was now removed, and the trachea, which had been already partially sutured, was completely closed by catgut stitches passing through the perichondrium and pre tracheal tissues. The skin was then closed with silkworm-gut.

The whole operation required about an hour and 20 minutes.

Her temperature on the afternoon of the operation rose to  $100.4^{\circ}$ . After that it was never above  $100^{\circ}$ , and by the second day had reached  $99^{\circ}$ . The external sutures were removed a week after the operation, primary union having taken place without any untoward result.

The foot of the bed was kept elevated for 48 hours. On the third day after the operation she was on the lounge; on the fourth day she sat up in a rocking-chair, and after that quickly got about. She was perfectly able to travel at the end of a week, but in consequence of the fear of possible complications, she remained in the hospital four days longer, leaving on the eleventh day. At this time Dr. Jones and I both examined her throat and found its lumen entirely normal. One silk suture could be seen partially loose when she went home. This annoyed her very little indeed, there being almost no cough. In fact, excepting for the soreness in swallowing, she suffered almost no pain whatever. For two days she was nourished by the rectum and then small quantities of liquid food were given her. On the fifth day she was able to take solid food. Her voice was never in the least affected.

Laryngoscopic examination on May 23, 1899, two months after operation, shows slight redness of the

vocal chords. The tracheal stricture shows no tendency to return. Her voice and breathing are normal.

The method adopted in attacking this possibly unique case (for we have not found any similar one recorded) was most satisfactory. The easy access to the stricture; the dissection of the mucous membrane from the surface of the stricture, and its replacement and suture; the avoidance of any tracheotomy; the advantages of the Trendelenburg posture, and the primary union obtained, are the points upon which we would lay the most stress.





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